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ABSTRACT

This study explored the relationship between classification achievements and mathematics scores. A series of 16 items which included many of the traditional tasks used in Piagetian examinations of intellectual function, were used in group presentations. Ten of these tasks required concrete operations including class inclusion, additive composition, multiple classification, conservations, parallel seriation, horizontal and vertical axes, and coordination of perspective. The remaining six tasks tested formal operations. Four districts in central New Jersey provided 529 pupils who took the group assessment of Piagetian tasks. The children were in a variety of grades from grade 4 to grade 9. The results supported findings from other research that maximum prediction of educational test scores results from combining traditional Intelligence Quotient (IQ) Scores and achievements on various Piagetian tasks. The ability of the score of classification achievements to predict mathematics performance points to improvements in the ability to predict mathematics performance. (MP)

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CLASSIFICATION AND IQ--ALTERNATIVE PREDICTORS OF MATH PERFORMANCE

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1. Classification and IQ--Alternative predictors of math performance.

2. Major objective.

This study explores the relation between classification achievements and mathematics scores. Almy (1966) found that early preschool mathematics performance was related to classification skills and Krakow and Curcio (1978) found that a composite of matrix classification and attribute sorting predicted future arithmetic level better than the inverse relationship in learning disabled boys. The present study seeks to discover the relationship between classification achievements and mathematics performance in later school years.

3. Theoretical framework.

Psychologists and educators have believed that Piaget's theory of intelligence should provide the link for assessing cognitive readiness in educational tasks. Consequently, it is expected that use Piagetian assessment tools will provide more specific readiness information than that provided by traditional IQ tests. Two problems have stood inthe way of the use of Piagetian assessment tools. First, research demonstrating the extent and nature of the link is meager. The second problem lies in the difficulties of teachers' assessment of developmental structures through the clinical interview. More tiem-efficient assessment methods are needed.

4. Methods and techniques.

Piaget test composition. A series of 16 items which included many of the traditional tasks used in Piagetian examinations of intellectual function were prepared for group presentation. Ten tasks required concrete operations including class inclusion, additive composition, multiple classification, conservations, parallel seriation, horizontal and vertical axes, and coordination of perspective. The remaining six tasks tested formal operations.

Each item was presented by appropriate materials and a transparency projector. The examiner circulated in the room, provided specific assistance, and clarified questions about the items. Eahc pupil had to choose one answer from a set of four and write a justification for his choice. The examiner also read each answer choice and attempted to get each child's best answer.

Scoring. Each item was scored in two ways. Any choice of an incorrect answer was given a score of 0. A correct choice with inadequate justification recieved a 1, and correct choice and adequate justification received a 2.

5. Data source.

Four districts in central New Jersey provided 529 pupils who took the group assessment of Piagetian tasks. The children were in a variety of grades from 4 to 9. The children also had taken CAT achievement tests or the New Jersey Minimum Basic Skills (MBS) tests. An IQ (either CAT or Lorge-Thorndike) was available for each child.

6. Results and Conclusions

Analysis by Guttman scaling. Four classification items, class inclusion (fruit), additive composition, multiple classification, and parallel seriation were analyzed by PROCEDURE GUTTMAN of the Statistical Analysis System (1979). Of the pupils, 344 showed scalogram patterns consistent with a Guttman scale, while 185 did not. The coefficient of reproducibility was .848, the minimal marginal reproducibility was .599, and the coefficient of scalability was .456. The correlations among the items were all positive, and the item-total correlations were all at least .359. The scale reliability was .752.

Prediction of math performance by classification and IQ. A score of classification achievements was computed by adding the number of items passed. IQ, the classification score, and sex were used as predictors of each mathematics summary score using PROCEDURE STEPWISE of SAS. These analyses were perfo rmed separately for each school district and for children who did or did not meet scale requirements. The results are shown in Table 1.

In general, the measure of classification achievements was much more important to the prediction of math performance, as a supplementary predictor, when the child's classification scores met the requirement of a Guttman scale.

Conclusions. The present research supports Whyte's (1977) findings that maximum predict;ion of educational test scores results from combining traditional IQ Scores and achievements on various Piagetian tasks. This study and reasearch by Almy(1966) suggest that classification achievements are related to a variety of math skills. It is likely that this relation comes from the common skills required by toy--the ability to group objects into classes and to simultaneously look at calssification in two dimensions.

7. Educational Implications

There are important advantages to group methods of assessing the development of Piagetian structures, particularly when rules of standardized testing are relaxed to assure student understanding. The ability of the score of classification achievements to predict math performance points to important improvements in our ability to predict math performance.

8. References.

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SIGNIFICANT SQUARED MULTIPLE CORRELATIONS FOR PREDICTING A VARIETY OF MATHEMATICS VARIABLES FROM IQ, SEX, AND CLASSIFICATION USING STEP-WISE REGRESSION

VARIABLE	DISTRICT 1		2		3	3	4	4
	Scale (N=23)	Not (N=10)	Scale	Not	Scale (N=28)	Not (N=59)	Scale (N=52)	Not (N=95)
CAT MATH COMPUTATION		IQ (.267)	---	---	IQ (.443)	IQ+Class+Sex (.367)	IQ .120)	IQ+Class (.268)
CAT MATH CONCEPTS AND APPLICATIONS		CLass (.139) N=35	---	---	IQ+CLass (.554)	IQ+Class+Sex (.368)	IQ+Sex+Class (.378) N=14	IQ (.257) N=40
MBS MATH COMPUTATION	IQ (.232)	IQ (.403)	---	---	---	---		IQ+Sex (.326)
MBS MATH CONCEPTS	IQ (.712)	IQ+Class (.418)	---	---	---	---		Sex (.167)
MBS MEASUREMENT	Sex (.304)	IQ (.296)	---	---	---	---	Sex (.100)	IQ+Sex (.243)
MBS MATH PROBLEM SOLVING	IQ (.401)	IQ (.425)	---	---	---	---		IQ (.085)